

STATUS OF THE CLAIMS SECTION:

Claim 1 (previously presented): A method of inspecting a contour of a target object, said method comprising the steps of:

- preparing a variable-density image of said contour;
- extracting edge pixels along and from said contour on said image;
- measuring directions of said edge pixels, the direction of each of said edge pixels being defined as a direction that makes a specified angle with the direction of the density gradient on said variable-density image at, said each pixel;
- selecting said edge pixels sequentially one edge pixel at a time and comparing the direction of said one edge pixel with the direction of another of said edge pixels at a specified distance from said one edge pixel to obtain a comparison result;
- determining presence or absence of a defect in said contour from the comparison results obtained for said edge pixels; and
- obtaining an edge code $E_c(x, y)$ for each of said edge pixels as follows:
 - $E_c(x, y) = \text{atan}\{E_y(x, y)/E_x(x, y)\}$ if $E_x(x, y) > 0$ and $E_y(x, y) \geq 0$;
 - $E_c(x, y) = 360^\circ + \text{atan}\{E_y(x, y)/E_x(x, y)\}$ if $E_x(x, y) > 0$ and $E_y(x, y) < 0$;
 - $E_c(x, y) = 180^\circ + \text{atan}\{E_y(x, y)/E_x(x, y)\}$ if $E_x(x, y) < 0$;
 - $E_c(x, y) = 0^\circ$ if $E_x(x, y) = 0$ and $E_y(x, y) > 0$; and
 - $E_c(x, y) = 180^\circ$ if $E_x(x, y) = 0$ and $E_y(x, y) < 0$;

where (x, y) is the coordinate of said each edge pixel, and $E_x(x, y)$ and $E_y(x, y)$ are respectively the x-component and the y-component of the density gradient at position (x, y) ; and

wherein the step of comparing the direction comprises the step of comparing the edge code of said each edge pixel with the edge code of said another edge pixel.

Claims 2 (original): The method of claim 1 further comprising the step of selecting said specified distance.

Claim 3 (original): The method of claim 1 wherein the step of extracting edge pixels comprises the step of selecting one from a plurality of edge-extraction filters each with a mask of a different size.

Claim 4 (previously presented): An apparatus for inspecting a contour of a target

object, said apparatus comprising:

image input means for obtaining a variable-density image of said target object;

image extracting means for extracting edge pixels along and from said contour on said image;

measuring means for measuring directions of said edge pixels extracted by said edge extracting means, the direction of each of said edge pixels being defined as a direction that makes a specified angle with the direction of the density gradient on said variable-density image at, said each pixel;

comparing means for selecting said edge pixels sequentially one edge pixel at a time and comparing the direction of said one edge pixel with the direction of another of said edge pixels at a specified distance from said one edge pixel to obtain a comparison result; and

judging means for determining presence or absence of a defect in said contour from the comparison results obtained by said comparing means;

wherein said comparing means serves to obtain an edge code $E_c(x, y)$ for each of said edge pixels as follows:

$E_c(x, y) = \text{atan}\{E_y(x, y)/E_x(x, y)\}$ if $E_x(x, y) > 0$ and $E_y(x, y) \geq 0$;

$E_c(x, y) = 360^\circ + \text{atan}\{E_y(x, y)/E_x(x, y)\}$ if $E_x(x, y) > 0$ and $E_y(x, y) < 0$;

$E_c(x, y) = 180^\circ + \text{atan}\{E_y(x, y)/E_x(x, y)\}$ if $E_x(x, y) < 0$;

$E_c(x, y) = 0^\circ$ if $E_x(x, y) = 0$ and $E_y(x, y) > 0$; and

$E_c(x, y) = 180^\circ$ if $E_x(x, y) = 0$ and $E_y(x, y) < 0$;

where (x, y) is the coordinate of said each edge pixel, and $E_x(x, y)$ and $E_y(x, y)$ are respectively the x-component and the y-component of the density gradient at position (x, y) ; and to compare the edge code of said each edge pixel with the edge code of said another edge pixel.

Claim 5 (original): The apparatus of claim 4 wherein said measuring means measures an angle for each of said edge pixels, said angle indicating a perpendicular direction to the direction of density gradient at said each edge pixel.

Claim 6 (original): The apparatus of claim 4 wherein said comparing means include distance setting means for setting said specified distance.

Claim 7 (original): The apparatus of claim 4 wherein said edge extracting means selects one from a plurality of edge-extraction filters each with a mask of a different size and

extracts said edge pixels by using said selected edge-extraction filter.

Claim 8 (previously presented): The method of claim 1 wherein said specified angle is 90°.

Claim 9 (previously presented): The apparatus of claim 4 wherein said specified angle is 90°.

Claims 10 and 11 (canceled).